

### REMARKS

Claims 1-15 are pending; claims 1-9 have been amended and claims 10-15 have been added. The indicated allowability of claims 3 and 5-7 is noted with appreciation.

The specification has been amended to add headings. The abstract has been corrected to a single paragraph. Marked-up versions only are provided of the amendments to the specification and abstract.

### EXPLANATION OF CHANGES TO DRAWINGS

Fig. 5 has been amended in accordance with the examiner's suggestion. The reference characters have been changed to avoid duplication of characters used in figures 1-4. The attached new Fig. 5 has new reference numerals 21-33. Number 33 replaces number 13 which is a thermocouple in Fig. 5 (page 14, line 9). Further, reference numerals 4 and 8, which were not present in original Fig. 5, are now represented as 24 and 28, respectively, in the new drawing. The appropriate changes have also been made in the specification on pages 10 and 12-14.

### Discussion of Amendments

It is believed that the examiner's objections to the drawings, specification and Abstract have been obviated by the above changes.

It is also believed that the rejections of claims 1-9 under 35 USC § 112, second paragraph, have been overcome by the present amendment.

Claim 1 has been amended to incorporate claim 3. Furthermore, the expression "the catalytic conversion" has been amended to "a catalytic conversion" and the

expression "the intake air" has been amended to "an intake air."

New claim 10 corresponds to original claim 1, in which the expression "or of an intake air" is removed and the expression "the catalytic conversion" has been amended to "a catalytic conversion."

The expression "a process" in claims 2 and 3 has been amended to "the process" and claims 2 and 3 now depend from new claim 10.

Claim 4 has been redrafted for clarification.

In claim 5, the expression "a process" has been amended to "the process" and the expression "a catalyst" has been amended to "the catalyst.:

In claims 6 and 7, the expression "a process" has been amended to "the process."

In claim 8, the expression "a process" has been amended to "the process" and the expression "the oxidation" has been amended to "an oxidation."

In claim 9, the expression "the catalytic conversion" has been amended to "a catalytic conversion."

New claims 10-15 correspond to original claims 4-9.

The conception of the amended and new claims is as follows:

- Claim 1 concerns a process for a catalytic conversion of fuel, in which fuel and a part-stream of the exhaust gas or of an intake air are converted in a converter, wherein the fuel is at least partially oxidized to carboxylic acids and/or carboxylic anhydrides.

- Claims 2 and 3 concern a process for a catalytic conversion of fuel, in which fuel and a part-stream of the exhaust gas are converted in a converter, and are dependent on new claim 10.
- Claims 4-8 concern a process for removing oxides of nitrogen from exhaust gases of internal combustion engines, wherein a process as claimed in claim 1 is carried out. Claims 4-8 are dependent claims of claim 1.
- Claims 9 concerns a converter for a catalytic conversion of fuel.
- Claim 10 concerns a process for a catalytic conversion of fuel, in which fuel and a part-stream of the exhaust gas are converted in a converter.
- Claims 11-15 concern a process for removing oxides of nitrogen from exhaust gases of internal combustion engines, wherein a process as claimed in claim 10 is carried out. Claims 11-15 are ultimately dependent on claim 10.

**Discussion of rejections and remarks**

The present invention can be considered as containing two process modes and an apparatus. A first mode relates to a process for a catalytic conversion of fuel. Fuel and a part-stream of the exhaust gas or of an intake air are converted in a converter and the fuel is partially oxidized. The oxidation of the fuel in the converter is achieved by residue oxygen in the part-stream of the exhaust gas or by an intake air. The fuel is at least partially oxidized to carboxylic acids and/or carboxylic anhydrides.

A second mode relates to a process for a catalytic conversion of fuel. Fuel and a part-stream of the exhaust gas are converted in a converter. In this second mode, the

conversion of the fuel is only achieved by the part-stream of the exhaust gas. In the process according to the second mode no intake air is used.

Moreover, the present invention relates to processes for removing oxides of nitrogen from exhaust gases of internal combustion engines. In these processes, first a process for a catalytic conversion of fuel according to the first or to the second mode as mentioned above is carried out, and the product stream of the converter is combined with the exhaust gas of the internal combustion engine and is reacted over a catalyst for the degradation of the oxides of nitrogen.

Additionally, the present invention relates to an apparatus which is a converter for a catalytic conversion of fuel. The converter comprises a vaporization space and a conversion space connected thereto. The vaporization space has separate feeds for exhaust gas or intake air and fuel. The conversion space has a catalyst for the catalytic conversion of fuel. The vaporization space and the conversion space are so connected to one another that a heat transport from the conversion space into the vaporization space is possible.

Claims 1, 2 and 4 stand rejected as anticipated by Boegner et al., US 5,586,433 (Boegner). Boegner relates to a process and an apparatus for the selective catalyzed  $\text{NO}_x$  reduction in oxygen-containing exhaust gases of internal combustion engines. A metering pipe and an air pipe are connected to the cracked catalyst controllable as a function of temperature and the catalytically cracked defined fuel quantity is oxidized by simultaneously supplied air.

Boegner does not describe that the fuel is at least partially oxidized to carboxylic acids and/or carboxylic anhydrides (claim 1).

Additionally, the oxidation according to Boegner is only done by supplied air. According to the second mode of the application, the fuel is not oxidized by supplied air, but by a part-stream of the exhaust gas (claim 10).

Since independent claims 1 and 10 are not anticipated by Boegner, dependent claims 2-8 and 11-15 are also not anticipated.

Claims 1, 2, 4 and 8 stand rejected as anticipated by Balko et al., US 6,176,078 (Balko). Balko relates to the production of a highly reactive reducing gas mixture from vehicle fuel, which is introduced into the exhaust gas of an internal combustion engine operated at lean burn conditions and passed over a reducing catalyst to convert NO<sub>x</sub> emissions to benign emissions.

In contrast to the present application, Balko does not mention that the fuel is at least partially oxidized to carboxylic acids and/or carboxylic anhydrides (claim 1).

Additionally, Balko is silent as to the feature that the fuel is not oxidized by supplied air, but by a part-stream of the exhaust gas (claim 10).

Claims 2-8 and 11-15 are accordingly also not anticipated by Balko.

Claim 9 stands rejected as anticipated by Koch et al., US 3,828,736 (Koch). Koch discloses a converter for the catalytic conversion of fuel comprising a vaporization space and a conversion space. The fuel is fed to the converter by a pump (4) via a pipeline (5) to an evaporator (6) ahead of the entrance of the converter. A mixing

nozzle (7), for mixing the evaporated fuel with the oxygen containing gas, is at the evaporator. Consequently, the fuel and the intake air are not fed separately from one another into the converter as it is done according to claim 9 of the present application.

Therefore, claim 9 is considered to be novel over Koch et al.

Favorable action by the examiner is respectfully solicited.

**A check in the amount of \$110.00 is attached to cover the required one month extension fee.**

Please charge any shortage in fees due in connection with the filing of this paper, including Extension of Time fees to Deposit Account No. 11-0345. Please credit any excess fees to such deposit account.

Respectfully submitted,

KEIL & WEINKAUF



Edward J. Smith  
Reg. No. 24,070

1350 Connecticut Ave., N.W.  
Washington, D.C. 20036  
(202)659-0100

EJS/kas



FIG.5

